

CHM129

Preparation and Stoichiometry of Solutions

- 1) How many **grams** of NaOH are needed to prepare 25.00mL of a 0.500M NaOH solution?

$$M = \frac{\text{mol solute}}{\text{L solution}}$$

$$1 \text{ L} = 1000 \text{ mL}$$

$$25.00 \text{ mL} \left(\frac{1 \text{ L}}{1000 \text{ mL}} \right) = 0.02500 \text{ L}$$

$$\text{mol solute} = M(L)$$

$$= 0.500 \text{ M} (0.02500 \text{ L}) = 0.0125 \text{ mol NaOH}$$

$$0.0125 \text{ mol NaOH} \left(\frac{40.00 \text{ g NaOH}}{1 \text{ mol NaOH}} \right) = \underline{0.500 \text{ g NaOH}}$$

- 2) How many **milliliters** of a 2.00M HCl solution do you need to make 500.0mL of a 0.100M HCl solution?

$$M_1 V_1 = M_2 V_2$$

$$M_1 = 2.00 \text{ M HCl} \quad M_2 = 0.100 \text{ M HCl}$$

$$V_1 = ? \quad V_2 = 500.0 \text{ mL}$$

$$(2.00 \text{ M}) V_1 = (0.100 \text{ M}) (500.0 \text{ mL})$$

$$V_1 = \underline{25.0 \text{ mL}} \text{ (of } 2.00 \text{ M HCl)}$$

- 3) How many **moles** of NaCl are in 20.0mL of 0.25g/mL NaCl solution?

$$20.0 \text{ mL} \left(\frac{0.25 \text{ g NaCl}}{1 \text{ mL sol'n}} \right) = 5.0 \text{ g NaCl}$$

$$5.0 \text{ g NaCl} \left(\frac{1 \text{ mol NaCl}}{58.44 \text{ g NaCl}} \right) = \underline{0.086 \text{ mol NaCl}}$$

4) Consider the reaction:



If 50.0mL of a 0.120M NaCl solution completely react with 75.0mL of 0.100M AgNO₃, how many grams of AgCl are produced? Identify the limiting reagent.

$$\text{mol NaCl} = (0.0500 \text{ L})(0.120 \text{ M NaCl}) = 0.00600 \text{ mol NaCl}$$

$$\text{mol AgNO}_3 = (0.0750 \text{ L})(0.100 \text{ M AgNO}_3) = 0.0075 \text{ mol AgNO}_3$$

$$0.00600 \text{ mol } \cancel{\text{NaCl}} \left(\frac{1 \text{ mol } \cancel{\text{AgCl}}}{1 \text{ mol } \cancel{\text{NaCl}}} \right) \left(\frac{143.32 \text{ g AgCl}}{1 \text{ mol } \cancel{\text{AgCl}}} \right) = 0.860 \text{ g AgCl}$$

$$0.0075 \text{ mol } \cancel{\text{AgNO}_3} \left(\frac{1 \text{ mol } \cancel{\text{AgCl}}}{1 \text{ mol } \cancel{\text{AgNO}_3}} \right) \left(\frac{143.32 \text{ g AgCl}}{1 \text{ mol } \cancel{\text{AgCl}}} \right) = 1.07 \text{ g AgCl}$$

AgCl produced: 0.860 g

Limiting Reagent: NaCl